

BIOLOGICAL SOCIETY OF WASHINGTON
OF THE
PROCEEDINGSA NEW CRAYFISH OF THE GENUS *ORCONECTES*
FROM THE NASHVILLE BASIN IN TENNESSEE,
WITH NOTES ON THE RANGE OF *ORCONECTES*
COMPRESSUS (FAXON) (DECAPODA, ASTACIDAE)By HORTON H. HOBBS, JR.¹

Apparently the first specimens of the new species described below were collected by Mr. J. E. Benedict at Nashville, Tennessee, in May, 1897. Faxon (1914:383) mistakenly identified them as *Orconectes validus*. Fleming (1939), in his report on "The Larger Crustacea of the Nashville Region," was apparently unaware of Faxon's record for *Orconectes validus*, and he included no reference to a form which can be ascribed to this species. It is possible that the range of this new species is somewhat restricted in the Nashville area; however, Dr. C. S. Shoup of Vanderbilt University, and Dr. Mike Wright of Tusculum College have collected it in several localities (see below) south of Nashville.

The Virilis section of the genus *Orconectes*, of which this species is a member, has a rather large range in the central part of the United States; however, only one member of this assemblage has been previously reported from the Cumberland River drainage. In "The Crayfishes of Kentucky. . ." Rhoades (1944:133) recorded *Orconectes compressus* (Faxon 1884:127) from the lower Cumberland drainage in Kentucky, but it is not known to occur in tributaries above the mouth of Little River in Kentucky.

Since in my collection there are several new locality records for *Orconectes compressus*, I am including them below with a brief summary of the present knowledge of this species.

Genus *Orconectes* Cope 1872*Orconectes compressus* (Faxon)*Cambarus compressus* Faxon, Proc. Amer. Acad. Arts and Sci. 20:127, 1884.

Faxon 1884: 124, 127-128, 146; Faxon 1885a: 85, 86, 102, 105-107, 161, 167, 174, 178, Pl. V, fig. 6, Pl. X, figs. 2, 2', 2a, 2a'; Faxon 1885b: 359; Faxon 1914: 419; Fleming 1939: 306; Goodnight 1940a: 222-223; Goodnight 1940b: 170; Harris 1903: 60, 83, 146, 151; Hay 1899: 960, 962; Ortmann 1902: 278; Ortmann 1905: 110, 112, 127; Ortmann 1931: 90, 94, 95.

Orconectes compressus Hobbs 1942: 352 (by implication); Rhoades 1944: 113, 133, 134.

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In the bibliography above only three papers make any contribution to the distribution or ecology of *O. compressus*. In the original description Faxon (1884:128) gives two locality records, but ecological notes are wanting. No new information was published until Goodnight (1940) gave an account of the rediscovery of *O. compressus* in Mississippi. The third contribution was that of Rhoades (1944) who recorded this species from several counties in Kentucky and noted observations he had made on its habits.

Range.—Tributaries of the Tennessee River in Alabama, Mississippi and Tennessee; tributaries of the Cumberland River in Tennessee and Kentucky; and tributaries of the Barren River in Tennessee and Kentucky.

ALABAMA

Lauderdale County—Tennessee drainage.

1. ²Second Creek, Waterloo (Type Locality)—Faxon 1884:128.
2. ²Cyprus (sic.) Creek—Faxon 1884:128.
3. Second Creek, Waterloo (1 ♂ I, 1 ♀)—L. Stewart, collector, December 7, 1938.
4. Cypress Creek, 3 miles north of Florence (4 ♂ ♂ II, 12 ♀ ♀)—L. J. Marchand, collector, June 8, 1941.

Limestone County—Tennessee drainage.

5. Six miles east of Athens, U. S. Hy. 72 (1 ♂ II)—L. J. Marchand, collector, June 8, 1941.

KENTUCKY (Rhoades 1944:133) No localities were cited.

6. *Barren County*—Barren River to Ohio River.
7. *Simpson County*—Barren River to Ohio River.
8. *Allen County*—Barren River to Ohio River.
9. *Warren County*—Barren River to Ohio River.
10. *Trigg County*—Little River to Cumberland River.

MISSISSIPPI

Tishomingo County—Tennessee drainage.

11. “. . . small stream between Iuka, Mississippi and the Alabama border near U. S. Route 72” (10 ♂ ♂ II, 12 ♀ ♀)—C. J. Goodnight (1940:222), collector, August 22, 1939.

TENNESSEE

Clay County—Barren River to Ohio River.

12. Big Trace Creek, Hermitage Springs (8 ♂ ♂ II, 1 ♀)—C. S. Shoup, Mike Wright, and H. H. Hobbs, collectors, April 29, 1945.

Maury County—Duck River to Tennessee River.

13. Creek near Mt. Pleasant (2 ♂ ♂ II, 1 ♀)—Fred Campbell, collector, Summer 1945.

Ecology.—The first ecological notes published on *O. compressus* were those of Goodnight. In describing the Mississippi locality cited above he stated “The crayfishes were found in a small rocky stream with a bed of pebbles and sand. The water was clear and cold, apparently spring fed. This observation would tend to indicate that this species is an inhabitant of the clear cold streams of the hills of the area. When disturbed the crayfishes hid by crouching on the bottom of the creek. Their brown color made them very difficult to detect against the stream

²From the two localities C. L. Herrick collected 18 ♂ ♂ I, 2 ♂ ♂ II, and 19 ♀ ♀, in October, 1882.

bottom. . . This species is extremely fast and agile in its movements." Goodnight (1940:222).

According to Rhoades, *Orconectes compressus* "is a common species of the lower Tennessee and tributaries" (1944:133); however, he cites no records except those of Faxon and Goodnight. Further, he states that this "species has crossed the drainage divide between the Cumberland and Barren rivers. The species is common to abundant throughout the Barren River drainage" (ibid.). Since this species has not been found in the upper Cumberland I judge that Rhoades is postulating the crossing of the divide in Kentucky. With reference to the habits of *compressus* in Kentucky he points out that specimens are "easily mistaken for immatures of associated species in seined collections and their color blends so perfectly with the gravelly stream beds that they are difficult to detect for hand collecting. These characters combined with their habit of remaining motionless on the bottom when disturbed may account to some extent for the obscurity of the species" (ibid.).

Cypress Creek is a rock and gravel bottomed, clear, swift stream some 20-60 feet wide with occasional deep holes having muddy bottoms. In writing to me about *O. compressus* in this locality Mr. Marchand stated that they "live in holes in the gravel along edges of quiet shallow pools." About the locality near Athens, he described the creek as a "small, rocky-bottomed creek with a good flow of clear water."

Big Trace Creek at Hermitage Springs where I collected was a very swift, clear, rock and gravel bottomed stream and some three feet deep in the deepest place. The water was so swift at the time I collected there that when I waded in over two feet it was difficult to stand. Here the crayfish had apparently scooped out shallow burrows under the larger pebbles and stone, and when these stones were turned the crayfish in most instances remained perfectly still until further molested, whereupon they swam away with amazing rapidity. Whereas most of the specimens which escaped my net took advantage of the strong current and went down-stream, a number of them demonstrated their swimming ability by making fairly good headway for short distances upstream.

Thus it seems probable that this species is associated with clear, rock or gravel bottomed streams, and the widely scattered localities suggested a rather widespread distribution in Tennessee.

The morphological differences which exist between the specimens which I have examined are negligible.

Orconectes rhoadesi,³ sp. nov.

Cambarus validus Faxon, Mem. Mus. Comp. Zool., Harvard Coll., 40 (8): 383, 1914, (in part). Ortmann, Ann. Carnegie Mus., 20 (2):94, 1931, (in part).

Diagnosis.—Rostrum with margins interrupted, small lateral spines or tubercles may or may not be present; margins not conspicuously thickened, either subparallel or slightly convergent; median carina absent. Chela punctate except for two irregular rows of ciliated squamous tubercles along inner margin of palm; opposable margin of immovable finger bearded at base. Areola approximately 8 or 9 times

³I take pleasure in naming this new species in honor of my friend and colleague, Dr. Rendell Rhoades, of the Ohio Division of Conservation and Natural Resources.

longer than broad with two or three punctations in narrowest part—length 32-34 percent of entire length of carapace. In male, hooks on ischiopodite of third pereopod only. Terminal elements of first pleopod of first form male extending to base of second pereopod, and separated for some distance proximad of tips; terminals, subequal in length and subparallel, *extend almost straight to base of distal third where they bend abruptly caudad* so that the distal cephalic surfaces of both are almost at right angles to the main shaft of the appendage. Annulus ventralis immovable (see fig. 9 for surface contour).

Holotypic Male, Form I.—Body subovate, somewhat depressed. Abdomen narrower than thorax (14.9-16.6 mm.). Width of carapace greater than depth in region of caudodorsal margin of cervical groove (16.6-13.4 mm.).

Areola of moderate width (8.3 times longer than broad), with two or three punctations in narrowest part; cephalic section of carapace about 2.1 times as long as areola (length of areola about 32 percent of entire length of carapace).

Rostrum with margins not thickened, slightly divergent at base, but for the most part subparallel. Upper surface concave and with prominent, somewhat crowded punctations. Base of acumen set off by minute corneous tubercles. Acumen short; tip broken in holotype but ending in a long spine in other specimens; this spine reaching distal end of peduncle of antennule. Subrostral ridge moderately developed and evident in dorsal aspect for more than half the length of the rostrum. Weak rostral ridge flanked mesially by a row of setiferous punctations.

Postorbital ridge prominent, grooved laterad, and terminates cephalad in a small corneous tubercle. Suborbital angle weak and rounded. Branchiostegal spine small but acute. Small lateral spine present on each side of carapace. Surface of carapace granulate laterally and bearing conspicuous punctations dorsally; the usual polished area in the gastric region bearing conspicuous punctations also.

Cephalic section of telson with a single spine in each caudolateral corner.

Epistome with lateral portions raised (ventrally) and a small cephalo-median projection (see fig. 8).

Antennule of the usual form with a small spine present on ventromesial surface of basal segment.

Antennae broken in holotype but extending caudad to last abdominal segment in other specimens. Antennal scale irregular in holotype but with a broad lamellar portion, broadest in middle; spine on outer cephalic margin moderately strong (see fig. 6).

Right chela somewhat depressed and elongated; palm somewhat inflated, marked above and below by prominent setiferous punctations. Inner margin of palm with two irregular rows of squamous tubercles—approximately seven in each row with a few additional ones at base. Fingers distinctly gaping. Upper surfaces of both fingers with a submedian ridge devoid of punctations and a somewhat narrower one lying toward the opposable margin. Opposable margin of immovable finger with a single row of 12 low rounded corneous tubercles and a conspicuous tuft of plumose setae on proximal two-thirds of lower opposable surface. Opposable margin of dactyl with a row of 14 tubercles similar to those on immovable finger. A single row of minute denticles occurs

on the distal third of the opposable margins of both fingers. Lateral margin of immovable finger strongly convex and not keeled along basal portion. Mesial margin of dactyl with a few small squamous tubercles on basal third. Lower surfaces of both fingers with a poorly defined submedian ridge.

Carpus of first right pereiopod longer than broad with a deep longitudinal furrow above. Mesial surface with two tubercles—the distal one large and acute, the proximal one small and obtuse. Lower cephalic margin with a broad, low tubercle near middle, and a somewhat larger one on lateral angle. Upper surface strongly punctate, scattered punctations on other surfaces.

Upper surface of merus with two small acute tubercles near distal end; lower surface with a mesial row of nine very small tubercles and two laterad of this row, the more distal one of the latter two larger than all the others. Lower distal margin with a broad low tubercle on mesial and lateral angles. Scattered punctations on all surfaces.

Hooks on ischiopodites of third pereiopods only; hooks only moderately strong; proximal margin concave and bearing setae.

Coxopodites of fourth and fifth pereiopods not conspicuously ornamented.

First pleopod reaching coxopodite of second pereiopod when abdomen is flexed. Tip terminating in two distinct parts which are separated for more than half their lengths. Both terminals comparatively slender, and subparallel; their proximal two-thirds relatively straight, and at base of distal third of each, rather suddenly recurved caudad. Mesial process grooved distally on cephalolateral side. Central projection very slender distally and tapering to a point; tip extends almost as far caudad as does mesial process. Both terminals partially corneous.

Morphotypic Male, Form II.—Differs chiefly from the holotype in that most of the tubercles mentioned in the above description are spiniform. Cephalic section of telson with two spines in each caudolateral corner. Hooks on ischiopodites of third pereiopods reduced and knob-like. First pleopod with two terminals in apposition almost to tip; neither terminal slender nor corneous, and distal portions of both directed caudodistad at about a 60 degree angle to the main shaft of the appendage. See measurements for other differences.

Allotypic Female.—Except for body proportions (see measurements) and secondary sexual characters, the allotype agrees with the description of the holotype very well. Annulus ventralis subovate with the greatest length in the transverse axis; narrow deep anteromedian groove extends from midcephalic margin caudosinistrad to midlength where it joins a prominent central depression; in the cephalodextral portion of the latter is the fossa or "orifice"; suture originates at the dextral margin of the central depression, and extends sinistrocaudad almost to the median line where it turns caudad and terminates before reaching the midcaudal margin of the annulus. (See fig. 9).

Type Locality.—Otter Creek between Granny White Pike and Hillsboro Pike, about seven miles south of Nashville, Davidson County, Tennessee. Dr. C. S. Shoup has kindly supplied me with the following information concerning the type locality. This stream drains Radnor Lake, about six miles southwest of Nashville, and is typical of lake drainages in this section of the Central Basin. Ordovician limestone

underlies the soils of this area, and the stream flows through alternating thin woods, pastures, and along a macadam road. "The rather high free carbon dioxide found along most of this stream is indicative of lower (bottom) lake seepage and drainage. . . . Food grade for bottom organisms good. Minnows abundant." The following data were obtained from two localities in the region from which the crayfish were taken. Station I—200 yards below Radnor Lake; and Station II—about two miles below Station I. Data taken on September 8, 1948, 1:00 P.M., overcast.

	Station I	Station II
Air Temperature	82°F	82°F
Water Temperature	67°F	70°F
pH ₁	7.4	7.4
pH ₂ , following aeration to remove CO ₂	8.1	8.1
Free CO ₂	9.5 p.p.m.	4.5 p.p.m.
Total Alkalinity (bicarbonate)	150.0 p.p.m.	150.0 p.p.m.
Rate of flow	not more than ½ ft./sec.	
General cover grade about	L ₂ S ₂ R ₄	

Measurements in Millimeters

	Holotype	Morphotype	Allotype
Carapace			
Height	13.4	11.7	11.0
Width	16.6	13.5	13.5
Length	31.3	27.7	27.0
Areola			
Width	1.2	1.0	1.0
Length	10.0	8.5	8.6
Rostrum			
Width	5.2	4.2	4.5
Length	8.3	7.9	7.5
Abdomen—Length	34.5	31.4	31.0
Right Chela			
Length of inner margin of palm	8.9	4.9	4.7
Width of palm	13.0	6.6	6.4
Length of outer margin of hand	33.8	18.4	16.3
Length of dactyl	23.0	12.3	10.5

Disposition of Types.—The male holotype and male morphotype (No. 87953) and the allotypic female (No. 87954) are deposited in the United States National Museum. Of the paratypes, one first form male and a female are deposited in the University of Michigan Museum of Zoology, and two first form males, one second form male, and two females are in my personal collection at the University of Virginia.

Specimens Examined.—TENNESSEE: *Davidson County*—Harpeth River to Cumberland—(1) the type locality (1 ♂ I, 1 ♂ II, 1 ♀) May 24, 1945, Mike Wright, coll.; (2) tributary to Harpeth River near Bellevue (2 ♂ ♂ I, 1 ♀) November 11, 1944, C.S. Shoup, coll.; (3) tributary to Harpeth River on Old Hickory Boulevard near Hillsboro Pike (1 ♂ I, 1 ♂ II, 2 ♀ ♀) November 11, 1944, C.S. Shoup, coll.; (4) Otter Creek (1 ♀) June 1, 1945, Mike Wright, coll.; (5) Otter Creek below Radnor Lake (1 ♀) June 9, 1945, Mike Wright, coll.; (6) Otter Creek at Hillsboro Pike (2 ♀ ♀) May 19, 1945, Mike Wright, coll. Mill Creek to Cum-

berland—(7) Mill Creek near Antioch (1♀) November 11, 1944, C. S. Shoup, coll.; (8) Mill Creek at Antioch Pike (1♂ immature) July 19, 1945, Mike Wright, coll. *Williamson County*—Little Harpeth River to Cumberland—(9) Pond along St. Hy 106 near Little Harpeth River just south of Davidson County line (2♂♂ imm., 2♀♀ imm.) May 24, 1945, Mike Wright, coll.

Variations.—Among the specimens listed above I can detect no variations of significance other than the usual differences associated with age.

Relationships.—*Orconectes rhoadesi* seems to have its closest affinities with *Orconectes validus* (Faxon 1914: 382). In fact the two species were confused by Faxon (*ibid.*: 383); however, they may be easily separated on the structure of the first pleopod of the male—in *validus* the cephalic surface is gently recurved through the distal half, while in *rhoadesi* it is almost straight to base of distal third where it is suddenly recurved caudad; further in *validus* the central projection does not extend nearly so far caudad as does the mesial process, but in *rhoadesi* it extends as far, or almost as far, caudad as does the mesial process. *O. validus* has been reported from the Tennessee River drainage from Huntsville, Madison County, Alabama.

I wish to express my appreciation to the following who have contributed most of the specimens on which this report is based: Dr. C. S. Shoup, Dr. Mike Wright, Mr. L. J. Marchand, Mr. Fred Campbell, and Mr. L. Stewart.

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Orconectes rhoadesi, sp. nov.

Explanation of Plate

Pubescence removed from all structures except figure 7.

- Fig. 1. Mesial view of first pleopod of first form male.
Fig. 2. Mesial view of first pleopod of second form male.
Fig. 3. Dorsal view of carapace.
Fig. 4. Lateral view of first pleopod of second form male.
Fig. 5. Lateral view of first pleopod of first form male.
Fig. 6. Antennal scale.
Fig. 7. Upper surface of chela of male, form I.
Fig. 8. Epistome.
Fig. 9. Annulus ventralis.
Fig. 10. Lateral view of carapace.

